ISEC 2018

8th IEEE Integrated STEM Education Conference

McDonnell and Jadwin Halls
Princeton University
Saturday, March 10, 2018

Program Book

◆ IEEE

Organizing Committee

Jeffrey Beck
Quality and Compliance Solutions
Local Arrangements Committee

Roger Ding
US Navy
Local Arrangements and Registration Committees

Susan K. Donohue, Ph.D.
University of Virginia
General Co-Chair

Ashutosh Dutta, Ph.D.
AT&T
IEEE PCJS EdSoc Chair
General Co-Chair

Srijoy Dutta
University of Maryland College Park
K-12 and Outreach Committee

Allen Katz, D.Sc.
The College of New Jersey
Trenton Computer Festival General and Program Chairs

Matthew Morrison, Ph.D.
University of Mississippi
Technical Program Committee

Nagi Naganathan, Ph.D.
Broadcom
IEEE PCJS Vice Chair and SSCS Chair
IEEE Liaison and Workshops Chair

Clifford Sayre
Hewlett-Packard Enterprise
Technical Program Committee

Vignesh Subbian, Ph.D.
University of Arizona
Technical Program Committee Chair
Webmaster

Ralph Tillinghast
Collaboration Innovation Lab, US Army ARDEC
Registration, Sponsorship, and Exhibits Committees

Wei-hsing Wang, Ph.D.
Princeton International School of Mathematics and Science
K-12 and Outreach Committee
K-12 Poster Chair

Thank you to our patrons!

Platinum

IEEE TV

Gold

IEEE Future Directions
MathWorks
Princeton International School of Mathematics and Science
STEAM Works Studio
Warp Worldwide, LLC

And to our IEEE Financial and Technical Sponsors!

Princeton/Central Jersey Section
IEEE Education Society, Electron Devices Society, Region 1, and Region 2

Acknowledgment

Many thanks to Emily A. Carter, Ph.D., Gerhard R. Andlinger Professor in Energy and the Environment and Dean of SEAS, Princeton University; Andrea Mameniskis, Assistant to the Dean; and Michelle Horgan, Senior Conference and Event Manager, for your kind hospitality in hosting ISEC '18!

We also appreciate very much the contributions of the volunteer reviewers, session chairs, conference staff, and "friends of the conference." The conference benefits greatly from the gifts of your time, skills, and knowledge.

Calendar of Events

8 am – 3 pm
REGISTRATION IN THE BRUSH GALLERY, McDONNELL HALL

8 – 11 am
BREAKFAST IN THE BRUSH GALLERY

9 am – 4 pm
POSTERS AND EXHIBITS IN McDONNELL HALL
Posters by K-12 Students
MathWorks: World's Leading Developer of Mathematical and Technical Computing Software
Akash Gopisetty and Elvira Osuna-Highley
Nexus Valley Solutions
Nicholas Truncale
STEAM Works Studio
Shubhendu Das

8:45 – 9 am
WELCOME

9 – 9:45 am
KEYNOTE ADDRESS
What Hurdles Should We Overcome to Provide 100% of Our Electricity From Renewable Sources?
Elie Bou-Zeid, Ph.D.
Associate Professor, Department of Civil and Environmental Engineering
Director, Program in Environmental Engineering and Water Resources
Princeton University

9:45 – 10 am
AWARDS CEREMONY

The above events will be held in McDonnell Hall A02

10:10 – 11:40 am
PAPER PRESENTATIONS

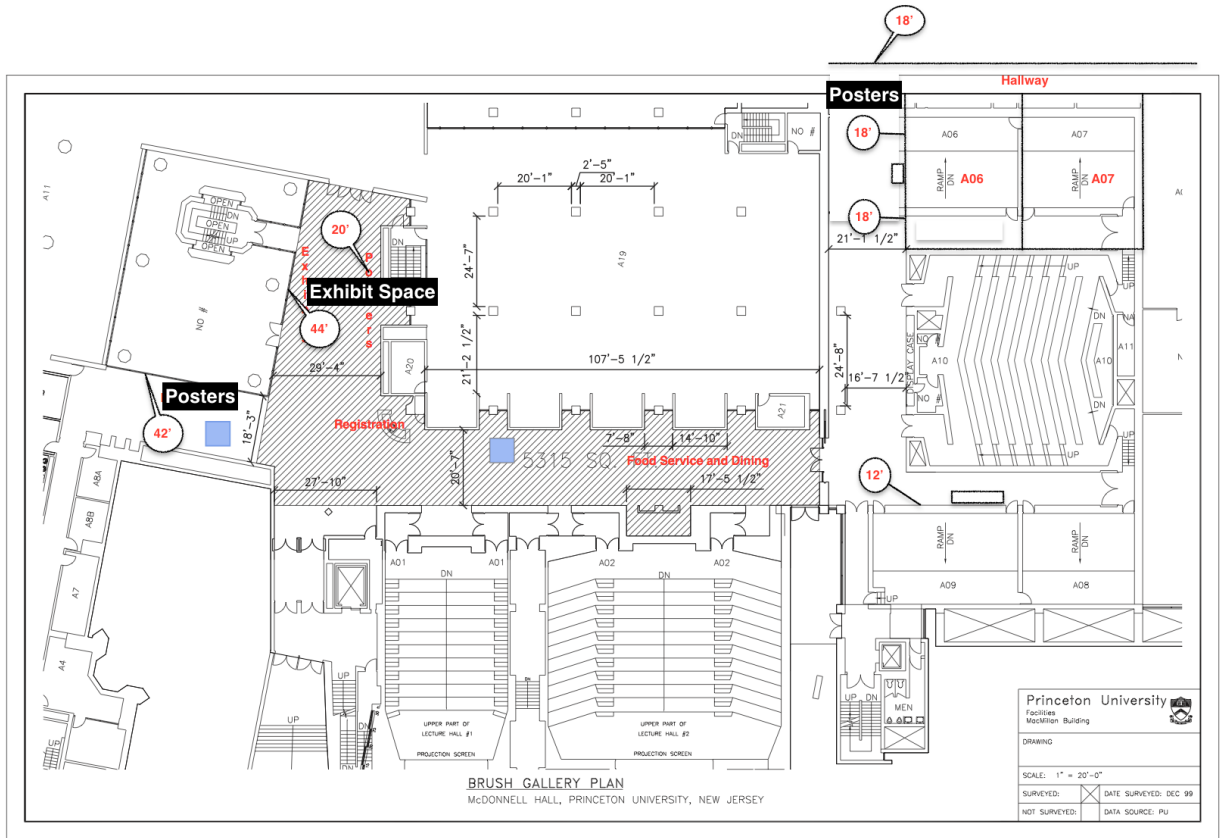**11:50 am – 1 pm**
LUNCH AND NETWORKING IN THE BRUSH GALLERY

1 - 2 pm
SPECIAL FOCUS ON POSTERS AND EXHIBITS

2 – 3:30 pm
WORKSHOPS

3:30 – 4:30 pm
PAPER PRESENTATIONS

ISEC 2018-2

CONFERENCE WELCOME

IEEE PRINCETON / CENTRAL JERSEY SECTION

WELCOME MESSAGES

IEEE PRESIDENT 2017
KAREN BARTLESON (VIDEO)

IEEE PRESIDENT 2018
JAMES (JIM) JEFFRIES

In today's world, we see the advantages and importance of education in Science, Technology, Engineering and Mathematics (STEM) not only for its immediate impact but how it sparks and will foster technical innovation for the future. Improving STEM education and increasing STEM jobs continues to be a universally relevant topic and is essential in meeting the demands of the global competitive economy.

Through a number of programs offered in these areas, IEEE is the resource of choice for learners and educators alike. TryEngineering.org offers an online portal to explore various educational resources for teachers, parents, and students. IEEE TryEngineering Summer Camps are being offered for the first time in 2018 for rising 8th-12th graders across the United States. And a new STEM eMentoring program connects professionals and students in grades three through five.

IE   nd support for STEM education to prepare students
to

I v   erence!

R

Keynote Speaker
Elie Bou-Zeid, Ph.D.

Elie Bou-Zeid is an associate professor in the Department of Civil and Environmental Engineering and the Director of the Program in Environmental Engineering and Water Resources at Princeton University, which he joined in 2008. His work focuses on the integration of theoretical, numerical and experimental approaches to study flow and transport in the lowest kilometer of the atmosphere, where humans live and have a direct impact on the planet. In particular, he is interested in applications related to the built environment (sustainable technologies form the building to the urban scales) and wind energy (wind turbine and farm design and wind power forecasting).

He is the recipient of the "Fondation Latsis Internationale" University Award (2009) and the E. Lawrence Keyes Jr. / Emerson Electric Co. Faculty Advancement Award from Princeton University (2011). Bou-Zeid holds a Bachelor's Degree in Mechanical Engineering (1997) and a Master's Degree in Environmental and Water Resources Engineering (2000) from the American University of Beirut. His Ph.D. in Environmental Engineering (2005) is from the Johns Hopkins University. Before joining Princeton, he worked as a postdoctoral researcher at the Swiss Federal Institute of Technology at Lausanne – EPFL (2005-2008).

What Hurdles Should We Overcome to Provide 100% of Our Electricity From Renewable Sources?

Abstract

With continued worldwide population and economic growth, total energy demand will inevitably rise. Reducing greenhouse gas (GHG) emissions will therefore require a fundamental shift in energy production modes, from fossil fuels to renewables with much lower emissions. All future scenarios put wind and solar at the center of this green energy revolution, but the inherent time-variability of these resources, and more importantly our rudimentary ability to forecast them, persist as the most substantial barriers for increasing the market penetration and reducing the effective cost of renewable-energy. In this talk, we will overview the science fundamentals of solar and wind energy, the current state of these technologies, and how STEM research is helping advance our ability to provide a larger fraction of our electric energy needs from clean sources. In particular, we will overview a novel mobile system built by Princeton University students that uses both wind and solar energy, and battery storage, to provide reliable electricity to locations where no grid exists or where the electric supply is interrupted.

AWARDS CEREMONY

IEEE-USA HARRY DIAMOND MEMORIAL AWARD
Presented by Peter A. Eckstein, IEEE-USA President 2016
To honor individuals for distinguished technical contributions in the field of electrotechnology
while in U.S. Government Service.

Paul C. Manz
Chief Scientist, US Army / PEO Ammunition
For outstanding contributions and exceptional technical leadership in the development,
engineering, and transition of enabling electrotechnologies required for combat overmatch
critical to the National Defense.

H. ROBERT (BOB) SCHROEDER BEST PAPER AWARD

Bob Schroeder, a life-long resident of the Trenton, NJ area, was a founding member of the
Princeton / Central Jersey Chapter of the IEEE Education Society, serving as its inaugural
chair. He retired as the communications and warning officer for the New Jersey Office of
Emergency Management, New Jersey State Police, and led a technology consulting company,
Adro!t. The Best Paper Award is given in his memory to honor his devotion to and expertise in
technical writing and engineering education as well as his service to the conference.

NOMINEES

A Making and Gaming Approach to Learning About RF Path Loss and Antenna Design
Kevin Richardson, Harley Fernandez, Kirsten Basinet, and Andrew G. Klein (Western Washington University,
USA); Richard K. Martin (Air Force Institute of Technology, USA)

CIRCUIT Summer Program: A Computational Neuroscience Outreach Experience for High-Achieving Undergraduates via Sponsored Research
Marysol Encarnacion (Johns Hopkins University Bloomberg School of Public Health & Applied Physics
Laboratory, USA); Caitlyn Bishop, Joseph Downs, Nathan Drenkow and Jordan K Matelsky (Johns Hopkins
University Applied Physics Laboratory, USA); Patricia K Rivlin (Janelia Research Campus, USA); Brock
Wester (Johns Hopkins University Applied Physics Laboratory, USA); William Gray-Roncal (Johns Hopkins
University & Preparation Meets Opportunity Foundation, USA)

Inspiring High School Students to Engage with Current Issues in Science and Medicine with an Interdisciplinary Course Entitled "Science and Literature of Disease"
Susie Kim and Nathan Stogdill (Polytechnic School, USA)

People Like Me: Providing Relatable and Realistic Role Models for Underrepresented Minorities in STEM to Increase their Motivation and Likelihood of Success
Nir Aish, Philip Asare, and Elif Eda Miskioglu (Bucknell University, USA)

STUDENT TRAVEL AWARDS
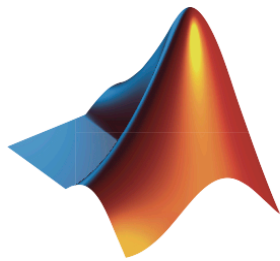
Platinum Sponsor

www.ieee.org
IEEE TV is graciously providing video coverage of
ISEC '18

Gold Sponsors

IEEE
Future Directions

www.ieee.org/futuredirections

MathWorks®

www.mathworks.com

PRISMS

**Princeton International School
of Mathematics and Science**

www.prismsus.org   admissions@prismus.org

Gold Sponsors

www.steamworksstudio.com

Our Academy is uniquely focused towards fostering and developing essential 21st Century and STEAM (Science, Technology, Engineering, Arts and Mathematics) skills like Problem-Solving, Critical thinking, Creativity and Collaboration in a hands-on and practical but fun learning environment. We believe that "Making" can transform the way we all learn, from preschoolers through retirees.

---

www.warpww.com
Reach for the Stars with WARP
Online Learning and Real World Experience to Enhance Your Life at Home and Abroad

WARP Worldwide is a global organization providing Lifewide and Lifelong K12 and college E-Learning courses and professional development programs for all ages. WARP's "Reach For The Stars" is a portfolio of learning products that serves students at pre-kindergarten through college and into adulthood.

> My heart is to create opportunities for children everywhere in the world by providing high quality educational information and resources to help them achieve at the highest level throughout their lives while embracing a global worldview.
>
> - Grace Arp, President of WARP Worldwide

Sponsor of the Twitter Contest

IEEE Financial Sponsor and Technical Co-Sponsors

Francis O'Connell, Chair
Nagi Naganathan, Vice Chair
Deepak Kataria, Treasurer
Roger Ding, Secretary
David Soll, Immediate Past Chair

Reviewers

Jeffrey Beck	Quality & Compliance Solutions
LaVonda Brown	Georgia Tech Research Institute
Roger Ding	US NAVY
Susan Donohue	University of Virginia
Ashutosh Dutta	AT&T
Amy Eguchi	Bloomfield College
Sean Hauze	San Diego State University
Nagi Naganathan	Broadcom
Rajesh Prasad	Saint Anselm College
Clifford Sayre	Hewlett-Packard Enterprise
Bernadette Sibuma	Worcester Polytechnic Institute
Vignesh Subbian	University of Arizona
Ralph Tillinghast	US Army & ARDEC
Huihui Wang	Jacksonville University

A06　Integrated K-12 and Outreach Programs I

Chair:　Susie Kim (Polytechnic School, USA)

10:20　*+Inspiring High School Students to Engage with Current Issues in Science and Medicine with an Interdisciplinary Course Entitled "Science and Literature of Disease"*
Susie Kim and Nathan Stogdill (Polytechnic School, USA)

10:35　*Robofest Carnival - STEM Learning through Robotics with Parents*
CJ ChanJin Chung and Elmer Santos (Lawrence Technological University, USA)

10:50　*Integrating Science Through Authentic Research in Secondary Schools*
Erik Mohlhenrich, Sergey V. Samsonau, and Roxanne P. Spencer (Princeton International School of Mathematics and Science, USA)

11:05　*Implementing High School Mathematics and Engineering Competencies: The RDFZ Integrated STEM Inquiry Research Program and Practice*
Yi Li and Xiaoning Zhai (The High School Affiliated to Renmin University of China (RDFZ), P.R. China)

11:20　*Integrating Algebra, Geometry, Music, 3D Art, and Technology Using Emoticoding*
Angelos Barmpoutis (University of Florida, USA)

11:35　*An Electric Karting Camp to Attract High School Students to a STEM Career: Phase 2*
Karl Perusich (Purdue University, USA)

A07　Community-Based Outreach and Pre-College Initiatives - I

Chair:　John Moore (Institute for Earth Observations at Palmyra Cove, USA)

10:20　*Towards Playful Learning and Computational Thinking - Developing the Educational Robot BRICKO*
Bjarke Pedersen, Jacob Nielsen, and Fardin Sherzai (University of Southern Denmark, Denmark)

10:35　*+CIRCUIT Summer Program: A Computational Neuroscience Outreach Experience for High-Achieving Undergraduates via Sponsored Research*
Marysol Encarnacion (Johns Hopkins University Bloomberg School of Public Health & Applied Physics Laboratory, USA); Caitlyn Bishop, Joseph Downs, Nathan Drenkow and Jordan K Matelsky (Johns Hopkins University Applied Physics Laboratory, USA); Patricia K Rivlin (Janelia Research Campus, USA); Brock Wester (Johns Hopkins University Applied Physics Laboratory, USA); William Gray-Roncal (Johns Hopkins University & Preparation Meets Opportunity Foundation, USA)

10:50　*Learning with Social Robots - The World Robot Summit's Approach*
Amy Eguchi (Bloomfield College, USA) and Hiroyuki Okada (Tamagawa University, Japan)

11:05　*Comparing Effectiveness of STEM Outreach Venues Utilizing Engineering Challenges*
Ralph Tillinghast (US Army & ARDEC, Picatinny Arsenal, NJ, USA); Edward Petersen (US Army, USA); and Mo Mansouri (Stevens Institute of Technology, USA)

11:20   *Union College EDGE Program: Inspiring High School Girls to Pursue Engineering*
         Jenny Lippmann (MJ Engineering and Land Surveying, P. C., USA); Cherrice Traver,
         James Hedrick, William Keat, and Gale Keraga (Union College, USA)

11:35   *Predictors of Success in Applied STEM Education through Guitar Building*
         Sean Hauze (San Diego State University & Claremont Graduate University, USA)
         and Debbie French (Wilkes University, USA)

A08   Inclusive STEM Outreach Programs
Chair: Bernadette Sibuma (Worcester Polytechnic Institute, USA)

10:20   *The Wisdom of our Native American Tribes: Advanced Math, Science and Culture for the
         Future*
         Ernesto Vega Janica (IEEE Standards Association, USA)

10:35   *Equal Accessibility to Computer Science Classes in High Schools in California*
         Jeffrey Miller and Courtney-Lynn Presto (University of Southern California, USA)

10:50   +*People Like Me: Providing Relatable and Realistic Role Models for Underrepresented
         Minorities in STEM to Increase their Motivation and Likelihood of Success*
         Nir Aish, Philip Asare, and Elif Eda Miskioglu (Bucknell University, USA)

11:05   *The College Prep Program at APL: An Experiential Model to Help High-Achieving,
         Underserved Students Trailblaze and Achieve Success*
         Karla Gray-Roncal, Liem Huynh, and Tammy Kolarik (Johns Hopkins University,
         USA); Maria Roncal (Preparation Meets Opportunity Foundation, USA); Mary Ann
         Saunders (Johns Hopkins University, USA); and William Gray-Roncal (Johns Hopkins
         University & Preparation Meets Opportunity Foundation, USA)

11:20   *Grade-Level Participation in the AP Curriculum*
         Adway S. Wadekar (Westborough High School, USA)

11:35   *Project iSWEST: Promoting a Culture of Innovation in Africa through STEM*
         George Boateng (Dartmouth College, USA) and Victor Kumbol (Kwame Nkrumah
         University of Science and Technology & Nsesa Foundation, Ghana)

A09   Computing in STEM Education I
Chair: Merlinda Drini (Queensborough Community College of CUNY, USA)

10:20   *Serious Games: Quality Characteristics Evaluation Framework and Case Study*
         Abdelbaset Jamal Naim Abdellatif, Barry McCollum, and Paul McMullan (Queen's
         University Belfast, United Kingdom)

10:35   *Using New Methodologies in Teaching Computer Programming*
         Merlinda Drini (Queensborough Community College of CUNY, USA)

10:50   *Leveraging Avid Use of Technology in Software Engineering Education*
         Swapna S. Gokhale (University of Connecticut, USA)

11:05   *Digital Piracy, Technology, the Legal System and Computing Education*
         Bryan Passione and Stefan Robila (Montclair State University, USA)

11:20   *Dynamic Hierarchical Learning Material for Educational Institutions*
         Michael Brown, Lewis Williams, and Michael Pelosi (University of Maryland University College, USA)

11:35   *Killing Two Birds with One Stone: Educating Students about the Impact of Cell-Phone Usage while Creating Metrics for the Prediction of Student Performance in an Undergraduate Computer Science Class*
         Ravi Rao (Datavani, USA)

A10   Integration in Higher Education I

Chair: Richard K. Martin (Air Force Institute of Technology, USA)

10:20   *Embedded Controlled Gardening: An Academically Based Service Course*
         Gerri Light and Jorge Santiago-Aviles (University of Pennsylvania, USA)

10:35   *Development of an Embedded System Course to teach the Internet-of-Things*
         Ravi Rao (Datavani, USA)

10:50   *Low-Cost Wearable Human-Computer Interface with Conductive Fabric for STEM Education*
         Eric Markvicka, Steven Rich, Jiahe Liao, Hesham Zaini, and Carmel Majidi (Carnegie Mellon University, USA)

11:05   *Modular Electronics for Broadening Non-Expert Participation in STEM Innovation: An IoT Perspective*
         Nikitha Ramohalli and Tosiron Adegbija (University of Arizona, USA)

11:20   *Novel Approach for Cybersecurity Workforce Development: A Course in Secure Design*
         Filipo Sharevski, Adam Trowbridge, and Jessica Westbrook (DePaul University, USA)

11:35   *Learning Style Analysis of Engineering and Technology Freshmen*
         Ruth Cueva, Jaime Calderón, Diego Salazar, and Gabriel Grijalva (Escuela Politécnica Nacional del Ecuador)

Unless noted otherwise, all workshops begin at 2 p m

A06   *Engaging Very Young Engineers w/ littleBits, Scratch, Raspberry Pi, and GoPiGo*
Robert Felekey (King Philip Middle School & Florence E. Smith STEM Elementary School, USA) and Madelyn Filomeno (St .Timothy Middle School, USA)

For the past four years, we have been exploring available educational pre-engineering technologies that are age appropriate for elementary and middle school students. With support and encouragement from the administrations at three schools in West Hartford, Connecticut, we have delivered after school programs ranging from several five to ten week sessions with littleBits to a two-year program with Scratch, Raspberry Pi and GoPiGo. Through creative engagement, productive exploration and, dare we say, "engineering," increasing numbers of diverse students are devoting significant amounts of their "free" time focused on circuit building, programming, robotics, and more importantly innovation, problem solving and following their curiosity. We are establishing environments where students are free to experiment, make mistakes, design, engineer, re-engineer, explore phenomena, and continuously problem solve while providing peer support and leadership in small groups. Please join us to explore these emerging educational technologies and gain hands-on experience to enable you to promote, mentor and develop informal education programs that appeal to young women and men.

A07   *EDS - ETC and Snap Circuits Workshop and Arduino Demonstration*
Luis Quevedo (Global EDS-ETC Program Leader, Colombia)

We will investigate initiatives to encourage the pursuit of Electrical Engineering education through pre-college outreach. These initiatives involve hands-on activities building circuits to introduce basic concepts of electronics.

At the beginning of the session we will start with hands on practice with Snap circuit projects guided by the assistants. The goal is to work with the Snap Circuit kits and constructing 6 circuits with different levels of complexity as explained in the provided guides. The session will end with a demonstration of programming using Snapino (Snap circuits + Arduino) kits. Each team will be given a kit with a program loaded in the controller to control 3 Light Emitting Diodes LEDs. The workshop is focused on stimulating creativity, curiosity, and logic so that the participants understand how electrical engineering applies as well as basic concepts presented in a manner that they will remember and enjoy technology for the rest of their lives. Upon completing the workshop, the participants will have learned and applied the tools to foster their curiosity providing them with a taste for the field of electrical engineering.

A08   *Integrating Gaming & Tinkering/Making in STEM Curricula*
Andrew G. Klein (Western Washington University, USA) and Richard K. Martin (Air Force Institute of Technology, USA)

Gamification and tinkering and are two active learning approaches that have recently attracted significant attention for their promise in enhancing STEM learning. These two approaches are generally distinct within the educational research community, but they work together naturally in informal learning environments such as local hackathons, drone competitions, and robotics competitions. Such events appeal to a wide age range with high self-motivation, regularly feature industry participation, have high public interest, and are scalable. This interactive education workshop will present participants with an approach to integrating these two approaches in STEM curricula for use in formal learning environments. For example, a wide range of open-ended exercises can be developed around many of the tools employed by makers, prompting students to adopt a maker mindset, employ improvisational problem solving, and hopefully become motivated to learn engineering concepts while actually building something.

A09   *Computational Thinking: An Offline Approach!*
Arta Szathmary (Bucks County Community College & STEMgirlz @ bccc, USA)

The 4 major parts of computational thinking (Decomposition, Pattern Recognition, Abstraction and Algorithmic Design) are used in all areas of education. We just need to connect the dots, make sure that students know why they are doing these activities and how they relate to any problem solving task. The year 2017 has brought many great minds together to create standards, best practices, professional development for teachers, and advanced placement tests for students (Computer Science Principles) We need to be aware of these and take advantage of great learning opportunities. Students have changed, schools have changed. We need citizens of the future to use the 4Cs-- Critical thinking and problem solving, collaboration, communication and creativity. Participants will explore one of the many tools and report back to the group on how these tools bring the 4Cs to life for students. A rubric will be supplied to help evaluate the particular tool.

A10   *Exploring Integration of Technology in Classrooms for Flipped Instruction and Active Learning Using Free Web Tools and Services* (to 3 pm)
Muhammad Safeer Khan and Mohamed Ibrahim (Arkansas Tech University, USA)

This workshop will cover fundamentals of flipped instruction for active learning, its potential benefits, and important considerations for teachers before implementing flipped instruction strategy in their classrooms. The essential elements of technology, pedagogy, and content knowledge (TPACK) framework, their interaction and its relevance to flipping the classroom instruction will also be focused during the workshop. A major objective of this workshop is to familiarize the audience with freely available web tools and resources that can help in implementing the flipped instruction strategy. The presenters will cover the web tools and provide a hands on demonstration to integrate technology in classrooms using those tools for flipped instruction.

An important element of implementing flipped instruction in classrooms is to assess its impact on student learning outcomes and their self-efficacy. The self-efficacy construct is used as a measure of students' self-judgment that reflects what students believe they can do with the skills they possess. The presenters will introduce the audience to approaches that can help them develop instruments to measure self-efficacy of students in their flipped courses and compare the results with lecture based methods. The presenters will also briefly cover methods to analyze the collected data through developed measures to study impact of flipped instruction on their students and draw conclusions that may help them improve pedagogy.

3:00   *Using MATLAB for STEM Learning*
Akash Gopisetty (MathWorks, USA)

MATLAB is used in more than 5000 universities and schools world-wide. MATLAB combines math, graphics, and programming in an environment that is easy to use and get started. It is used by millions of engineers and scientists to solve challenging real world problems. In this workshop, you will learn how you can use MATLAB to accelerate the pace of STEM discovery and learning. From teaching mathematics, physics and engineering in schools, to robotics in student competitions and enriching STEM outreach efforts.

A06 Integrated K-12 and Outreach Programs II

Chair: Bernadette Sibuma (Worcester Polytechnic Institute, USA) and William Gray-Roncal (Johns Hopkins University & Preparation Meets Opportunity Foundation, USA)

3:30 *Integrating Interactive Computer Simulations into K-12 Earth and Environmental Science*
Michelle Zhu, Nicole Panorkou, Pankaj Lal, Sownith Etikyala, Erell Germia, Pricilla Iranah, Bharath Samanthula, and Debasnita Basu (Montclair State University, USA)

3:45 *The Impact of an Integrated Pre-K STEM Curriculum on Teachers' Engineering Content Knowledge, Self-Efficacy, and Teaching Practices*
Bernadette Sibuma, Susmitha Wunnava, and Melissa-Sue John (Worcester Polytechnic Institute, USA); Florencia Anggoro (College of the Holy Cross, USA); and Mia Dubosarsky (Worcester Polytechnic Institute , USA)

A07 Community-Based Outreach and Pre-College Initiatives II

Chair: Nagi Naganathan (Broadcom, USA)

3:30 *Supporting Engineering Practices in Informal Learning Environments with a Tablet-Based Engineering Design Environment*
Deborah Hecht (CUNY Graduate Center & Center for Advanced Study in Education, USA); Jennie Chiu (University of Virginia, USA); Ishwar Bridgelal (Center for Advanced Study in Education, USA); and David Burghardt (Hofstra University, USA)

3:45 *High School Autonomous Vehicle Competition*
Marc Herniter (Rose-Hulman Institute of Technology, USA)

4:00 *Earth SySTEM: Investigating Earth from Space*
John Moore and Peter Dorofy (Institute for Earth Observations, USA); Michael Jabot (SUNY Fredonia, USA); Nidhal Bouaynaya and Rouzbeh Nazari (Rowan University, USA); and Brian Hagerty (IEEE, USA)

A08 Integration in Higher Education I

Chair: Jeffrey Beck (Quality and Compliance Solutions, USA)

3:30 *The Effect of Interactive Digital Storytelling Gamification on Microbiology Classroom Interactions*
Andreea Molnar (Lancaster University, United Kingdom)

3:45 *+A Making and Gaming Approach to Learning About RF Path Loss and Antenna Design*
Kevin Richardson, Harley Fernandez, Kirsten Basinet, and Andrew G. Klein (Western Washington University, USA); and Richard K. Martin (Air Force Institute of Technology, USA)

4:00 *Using Escape Room-Like Puzzles to Teach Undergraduate Students Effective and Efficient Group Process Skills*
Patrick Williams (Muhlenberg College, USA)

A09   Computing in STEM Education II

Chair: Clifford Sayre (Hewlett-Packard Enterprise, USA)

3:30   *Practical Problem-Based Learning: An Interdisciplinary Approach*
Rajesh Prasad, Barry Wicklow, and Carol Traynor (Saint Anselm College, USA)

3:45   *CS+PA^2: Learning Computer Science with Physical Activities and Animation - a MathDance Experiment*
CJ ChanJin Chung and Mark Kocherovsky (Lawrence Technological University, USA)

4:00   *A Case for Bringing Undergraduate Research into the Classroom*
Jameela Al-Jaroodi (Robert Morris University, USA)

A10   Integration in Higher Education III

Chair: Roger Ding (US Navy USA)

3:45   *An Engineering Design Formative Assessment: A Work in Progress*
Debra Brockway and Kenneth Llort (Educational Testing Service, USA)

4:00   *EPICS in IEEE: Encouraging the Pursuit of Engineering for Community Improvement*
Ray Alcantara (IEEE, USA)

McDonnell Hall

Chair: Wei-hsing Wang (Princeton International School of Mathematics and Science, USA)

3D Printing as a Disruptive Lens Shaping Technology
Chenhao Hu (Princeton International School of Mathematics and Science, USA)

A Novel Machine Learning Approach to Myocardial Infarction Detection
Vishnu Murthy (Thomas Jefferson High School for Science and Technology, USA)

A Projector, Dry Film Photoresist and Glass Based Fabrication Approach for Microfluidics Channels
Angel Xu (Princeton International School of Mathematics and Science, USA)

A Study into Employee Scheduling Problem Based on Graph Theory Algorithms
Feiyu Zhu, Zeyu Liu, Ziyao Yan and Yuancheng Liang (The High School Affiliated to Renmin University of China (RDFZ), P.R. China)

An Accessible Augmented Reality System to Address Spatial Reasoning Inequalities in STEM Education and Broaden the Appeal of Science Among Youth
Peter Wu (Lynbrook High School, USA) and Samuel Adesoye (Pilot AI Labs, USA)

An Implementation of Visible Light Communication Based on Raspberry Pi
Zihan Zhao, Tianren Wang, and Yi Li (The High School Affiliated to Renmin University of China (RDFZ), P.R. China)

Aptamer-based Colorimetric and Fluorescent Dual Detection of Carbendazim Pesticide via Inner Filter Effect of Gold Nanoparticles on CdTe Quantum Dots
Eugene Gao and Qiang Chen (Princeton International School of Mathematics and Science, USA)

Automating Reconstruction of Focused Ion Beam Current Density Distribution
Xuzhang Li (Princeton International School of Mathematics and Science, PBS&T, and MEO Engineering Company Inc., USA)

Bridging Between Electrochemistry and Microbiology for a Brighter Future: Microbial Fuel Cells
Nicole Ng (Princeton High School, USA)

Comparing the Sleep Quality Between STEM Student Athletes and Non-Athletes: An Exploratory Study
John Lorenzo Cardiño and Gian Carlo Gutierrez (La Salle Green Hills, Philippines)

Construction of a Device for Data Collection Using Intel Galileo Processors
Yash Parikh, Shibi Balamurugan, Alexander Ford, Vishal Rachapudi, Lucas Lopez, Manasi Soman, and Eshaan Soman (Hillsborough High School, USA)

Design and Application of the Structure of a Multifunctional Underwater Robot
Yuzhe Qin (Princeton International School of Mathematics and Science, USA)

Design and Construction of a Nanosecond Precision Lab Analogue to an Atomic Clock
Savva Morozov (Princeton International School of Mathematics and Science, USA)

Design and Implementation of Mobility System for a Multifunctional Underwater Robot
Zhichao Liu (Princeton International School of Mathematics and Science, USA)

Determination of the Defining Features of Texts Written in Isolation With a Naive Bayesian Classifier
Emily Becker (Princeton High School, USA); Judith Mildner, Dominic Burkart, and Diana Tamir (Princeton University, USA)

Development of an Easy-To-Use, Paper-Based Sensing Device for Colorimetric Detection of Formaldehyde
Yutong Dai and Qiang Chen (Princeton International School of Mathematics and Science, USA)

Effect of Using Digital Resources for Flipped Instruction in an 8th Grade Classroom
Zain Khan, Marwan Bit, and Amine Bit (Philip O. Berry Academy of Technology, USA)

Evaluation of a Hydrogen Production System with Enzyme Produced from Cell-Free Protein Synthesis
Jiaqi Huang (Princeton International School of Mathematics and Science, USA)

Evolutionary Analyses of RNA Editing and Amino Acid Recoding in Cephalopods
Mingye Wang and Erik Mohlhenrich (Princeton International School of Mathematics and Science, USA)

Experiencing STEM through FIRST Lego League
Nico Zakon (Fryeburg Academy, USA)

Exploring Use of Polystyrene Blending PCBM and PEDOT: DSS Layers as a Way to Improve Perovskite Solar Cell Stability
Jiaqi Lu (Princeton International School of Mathematics and Science, USA)

High School Autonomous Vehicle Challenge - Team HD Automotive
Haley Coleman (Terre Haute North Vigo High School, USA); Darrian Herniter (Rose-Hulman Institute of Technology, USA)

High School Autonomous Vehicle Challenge - Team Roadrunner
Nathan Shannon and Alexcis Merryman (Rose-Hulman Institute of Technology, USA)

High School Autonomous Vehicle Challenge - Team SWAT
Isaac Krosschell and Jackson Stipe (Rose-Hulman Institute of Technology, USA)

Identification of Novel Candidate Genes for Congenital Heart Defects using Gene Network Analysis
Gary Guo and Erik Mohlhenrich (Princeton International School of Mathematics and Science, USA)

Improved Temperature Monitoring for Working Dogs
Aaron Zakon (Robert Frost Public Charter School, USA)

Improving Recognition Accuracy of Handwritten And Printed Characters Under Imperfect Conditions
Ruichen Li (Princeton International School of Mathematics and Science, USA)

Instructing Cluster Transformation by Modeling, Sensing and Tracking
Hanyu Zhang (The High School Affiliated to Renmin University of China (RDFZ), P.R. China)

Investigating Neglected Memories in Targeted Memory Reactivation
Everett Shen (Princeton High School, USA)

Modeling Spread of Waterborne Disease in Networks through STEM
Pranav Unni (American International School Of Chennai, USA) and Pradyuta Padmanabhan (Foxcroft School, USA)

Paper-based Colorimetric Mercury Detection via Gold Nanorods
Xuanhe Qi (Princeton International School of Mathematics and Science, USA)

Paper-based Mercury Detection Implementing Gold Nanoparticles and Mercury-Specific Oligonucleotide
Zhengwei Wu and Qiang Chen (Princeton International School of Mathematics and Science, USA)

Protein Levels of HBA1 and ANK1 Associated with Breast Cancer Outcome
Stephanie Hu (Bridgewater-Raritan Regional High School, USA)

Soda Can Metamaterials
Oliver Tennant (Princeton High School, USA)

Solving Complex Problems with Low-cost Swarm Robotics
Nia Maywar (Princeton International School of Mathematics and Science, USA)

Testing the Capacity of Polyethylene Mesh as Strengthening Aggregate for Concrete
Seong Bin Son and Kevin Brian Tan (La Salle Green Hills, Philippines)

The Design and Implementation of a Novel Motor System for a Microcompressor
Justin Saintil (Princeton International School of Mathematics and Science, USA)

The Effect of Temperature on the Electrophysiology and Behavior of Venus Flytraps
Simran Kaur, Sreyashi Ghosh, Juliet Malkowski, and Aileen Wu (Princeton High School, USA)

The Improvement of Biomolecule-Coated Titanium (IV) Oxide Nanoparticles as Sunscreen Materials
Yichen Li and Qiang Chen (Princeton International School of Mathematics and Science, USA)

Visuospatial and Verbal Memory Differences Between Selected Male and Female Adolescents of the STEM Strand
Jan Uriel Marcelo and Aryan Arora (La Salle Green Hills, Philippines)

Save the Date!

9th IEEE Integrated STEM Education Conference

Saturday, March 16, 2019
Princeton University

ISEC